BRIGHTEK
BRIGHTEK (EUROPE) LIMITED
Brighten Up The World With LED!

PRODUCT DATASHEET

ATTENTION OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES

► PLCC6 SMD with IC

► 3535IC 1.47t Series

► Red/Green/Blue

N0M59S58IC

Sleep Mode

3 5 3 5 I C I n t e g r a t e d

APPLICATIONS:

- Telecommunication
- Indicator
- Home Appliance
- Decoration Lighting
- Full Colour LED Strip
- Gaming Device

Support sleep/wake up mode. In sleep mode the LED's current was lower than 5µA

3535 IC-Integrated

RoHS Compliant

AUTOMOTIVE AEC-Q102

FEATURES:

- **Package:** PLCC6 EIA STD Package with Integrated IC Sleep Mode Type 102
- **Forward Current:** 20mA
- **Forward Voltage (typ.):** +4.5~+5.5V
- **Luminous Intensity (typ.):** 2900mcd mixed white
- **Colour:** Red/Green/Blue
- **Wavelength:** 622/527/467nm
- **Viewing angle:** 120°
- **Materials:**
    − Resin: Silicone (White Diffused)
    − L/F Finish: Ag Plated
- **Operating Temperature:** -40~+85°C
- **Storage Temperature:** -40~+105°C
- **IC Feature:** Serial data transmission signal by DATA CLK two lines. One pixel contains R, G, and B colour that each can achieve 256 level brightness grayscales, which forms 16,777,216 combination colours. Support sleep/wake-up mode. In sleep mode, the LED current is lower than 5µA.
- **Soldering methods:** IR reflow soldering
- **Preconditioning:** acc. to JEDEC Level 3
- **Packing:** 12mm tape with Max.1300pcs/reel, ø180mm (7'')

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CHARACTERISTICS:

Absolute Maximum Characteristics (Ta=25°C)

Parameter	Symbol	Ratings	Unit
The Max. LED Output Current	I_{OMAX}	20/channel	mA
Rate of Data Signal	F_{CLK}	15	MHz
IC Power Supply Voltage	V_{DD}	<6.5	V
Power Dissipation	P_D	<400	mW
Operating Temperature	T_{OPR}	-40~+85	°C
Storage Temperature	T_{STG}	-40~+105	°C
Thermal Resistance Junction/Solder Point	RTH_{J-S}	230	°C/W
Soldering Temperature	T_{SD}	260	°C

Electrical & Optical Characteristics (Ta=25°C, V_{DD}=5V)

Parameter		Symbol	Values			Unit	Test Condition
			Min.	Typ.	Max.		
Forward Voltage		V_F	4.5	---	5.5	V	I_F=20mA
Luminous Intensity	R	I_V	530	900	1500	mcd	I_F=20mA
	G		1000	1700	2850		
	B		230	400	700		
	W		1700	2900	6000		
Dominant Wavelength	R	λ_D	615	---	630	nm	I_F=20mA
	G		520	---	535		
	B		460	---	475		
Colour Coordinate	X	---	---	0.2700	---	---	I_F=20mA
	Y		---	0.2400	---	---	
Viewing Angle		$2\theta_{1/2}$	---	120	---	deg	I_F=20mA

Electrical & Optical Characteristics (Ta=25°C, V_{DD}=5V)

Parameter	Symbol	Values			Unit	Test Condition
		Min.	Typ.	Max.		
Supply Voltage	V_{DD}	4.5	5.0	5.5	V	---
Input Voltage Level	V_{IH}	2.7	---	V_{DD}+0.4	V	---
	V_{IL}	-0.4	---	1.0	V	---
Clock High Level Width	T_{CLKH}	30	---	---	ns	---
Clock Low Level Width	T_{CLKL}	30	---	---	ns	---
Data Set-Up Time	T_{SETUP}	10	---	---	ns	---
Data Hold Time	T_{HOLD}	5	---	---	ns	---
Working Current (IC)	I_{DD}	---	---	2	mA	I_{out}=OFF
Static Current	I_{sleep}	---	---	5	μA	Sleep Mode
ESD Pressure (HBM)	V_{ESD}	---	6000	---	V	---

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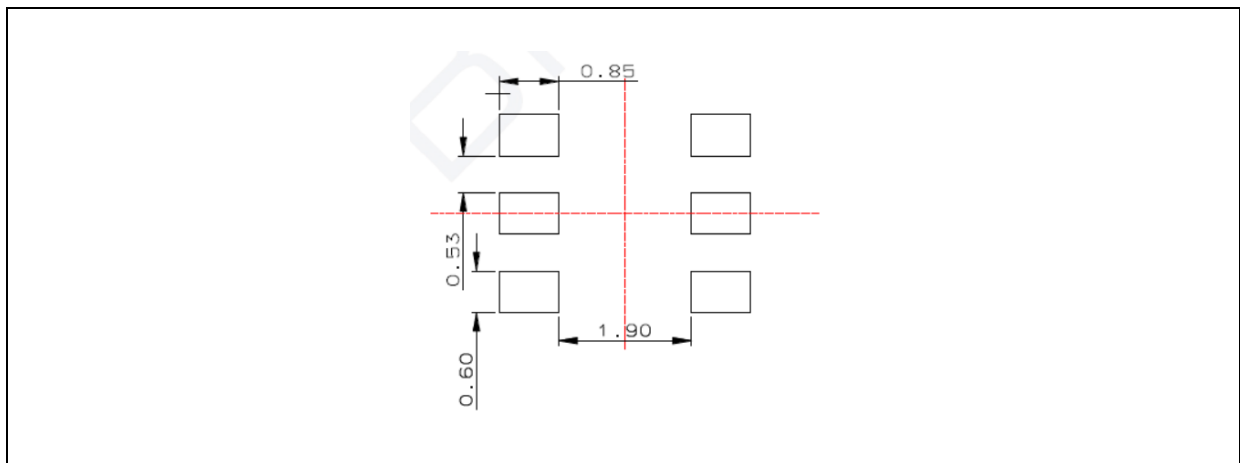
OUTLINE DIMENSION:

Package Dimension:
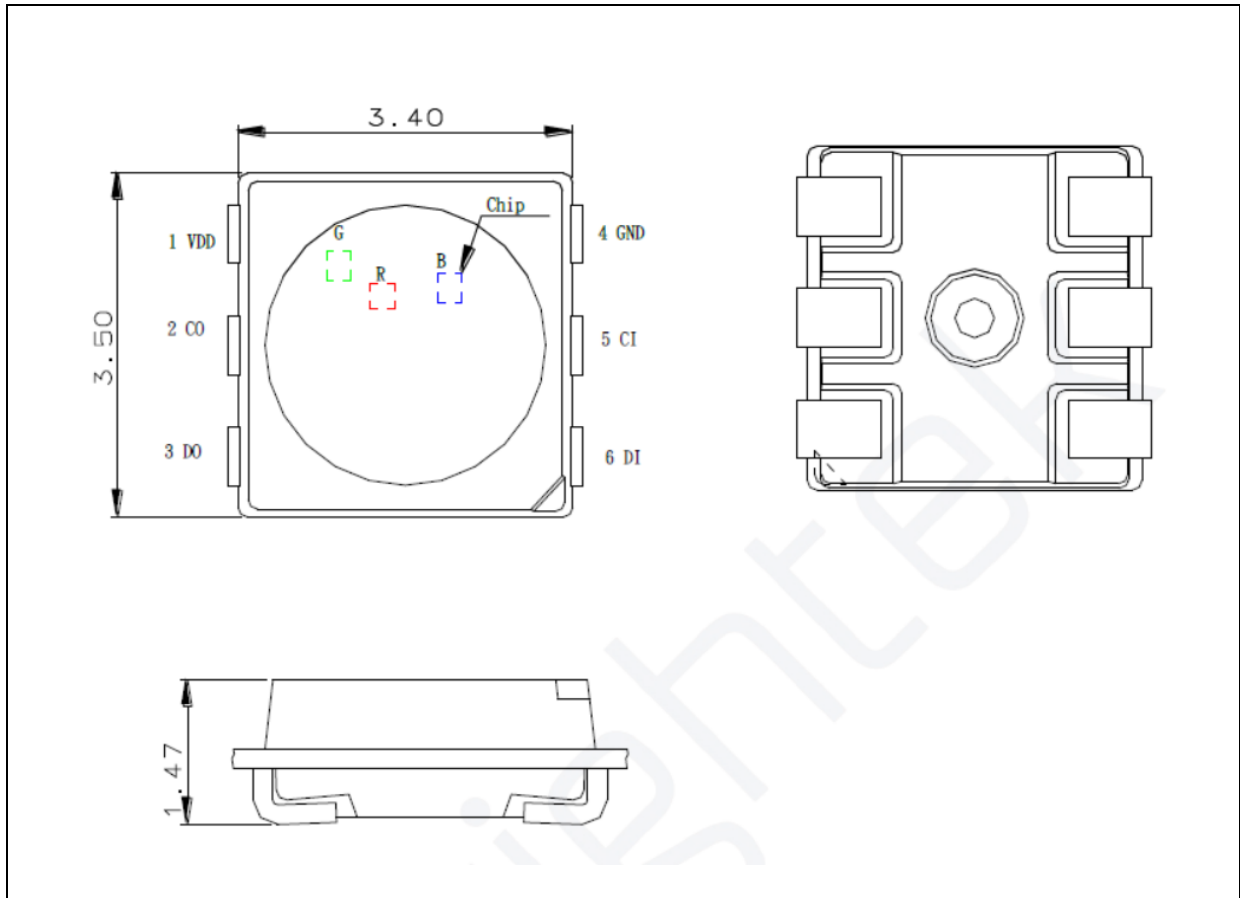
1. All dimensions are in millimetre (mm).
2. Tolerance ±0.2mm, unless otherwise noted.

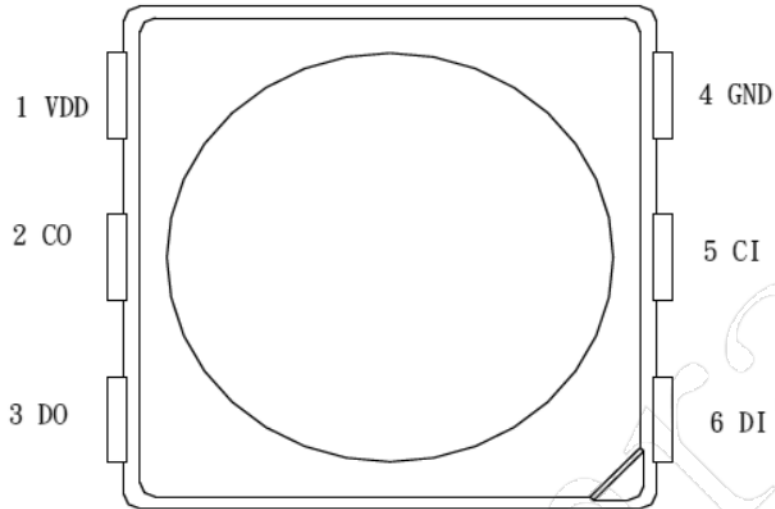Recommended Soldering Pad Dimension:

1. Dimensions are in millimetre (mm).
2. Tolerance ±0.1mm with angle tolerance ±0.5°.

PIN CONFIGURATION:

No.	Symbol	Function Description
1	VDD	Supply Voltage
2	CO	Clock Output
3	DO	Data Output
4	GND	Ground
5	CI	Clock Input
6	DI	Data Input

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BINNING GROUPS:

Luminous Intensity Classifications (White) (I_F = 20mA):

Code	Min.	Max.	Unit
17	1700	2200	
18	2200	2800	
19	2800	3600	mcd
20	3600	4800	
21	4800	6000	

CIE CHROMATICITY DIAGRAM:
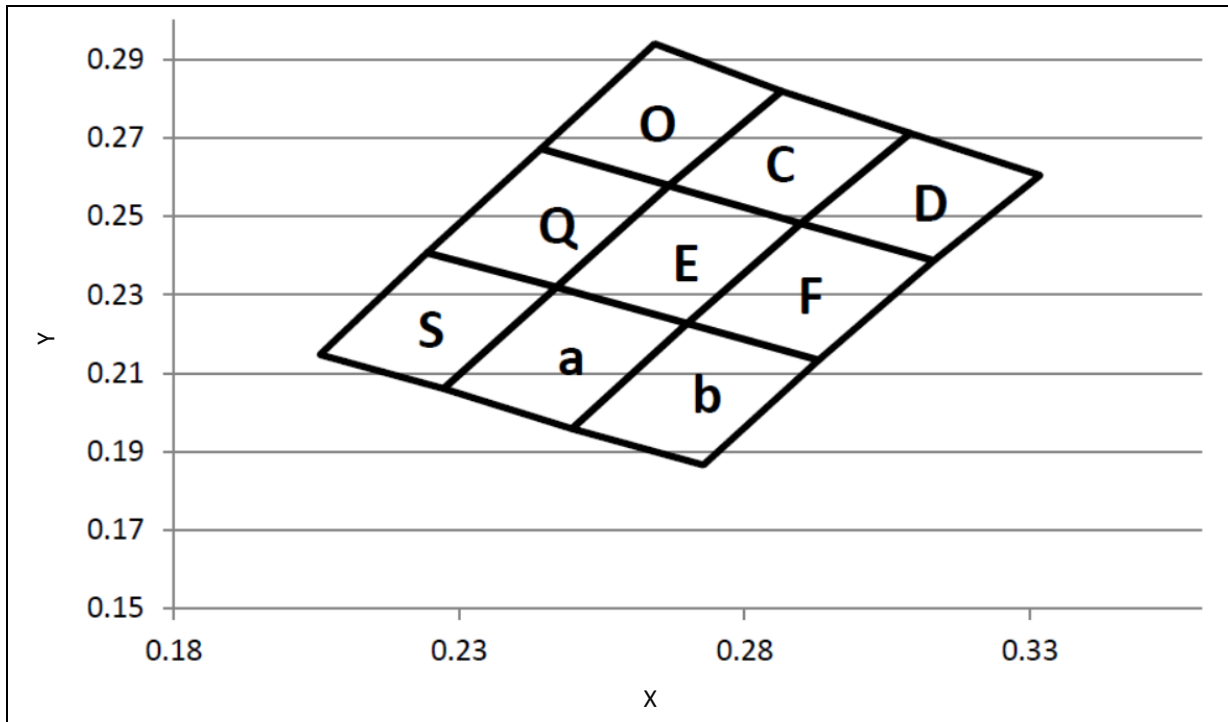
Chromaticity Coordinates Classifications (I_F = 20mA):

	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
O	0.2444	0.2672	0.2643	0.2940	0.2865	0.2819	0.2667	0.2578
C	0.2865	0.2819	0.3091	0.2712	0.2899	0.2482	0.2667	0.2578
D	0.3091	0.2712	0.3318	0.2605	0.3132	0.2387	0.2899	0.2482
Q	0.2444	0.2672	0.2244	0.2407	0.2471	0.2320	0.2669	0.2579
E	0.2667	0.2578	0.2899	0.2482	0.2700	0.2227	0.2470	0.2320
F	0.2899	0.2482	0.3132	0.2387	0.2930	0.2134	0.2700	0.2227
S	0.2244	0.2407	0.2056	0.2148	0.2273	0.2061	0.2471	0.2320
a	0.2471	0.2320	0.2273	0.2061	0.2498	0.1959	02700	0.2227
b	0.2700	0.2227	0.2498	0.1959	0.2728	0.1866	0.2930	0.2134

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ELECTRO-OPTICAL CHARACTERISTICS:

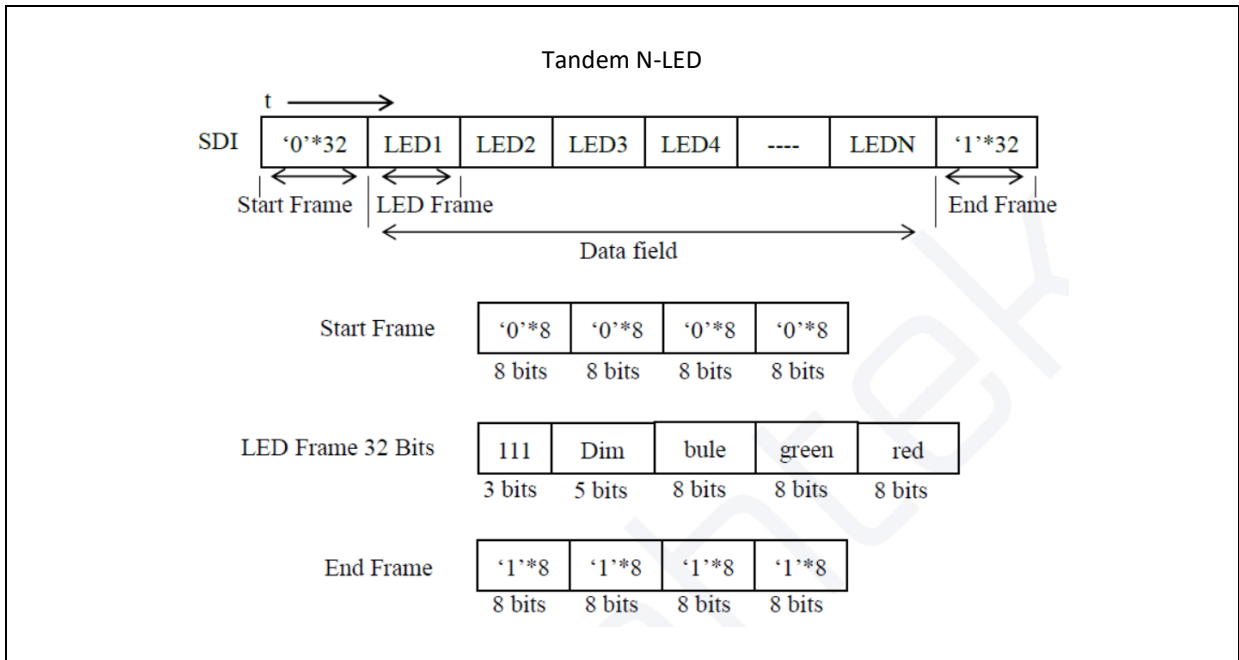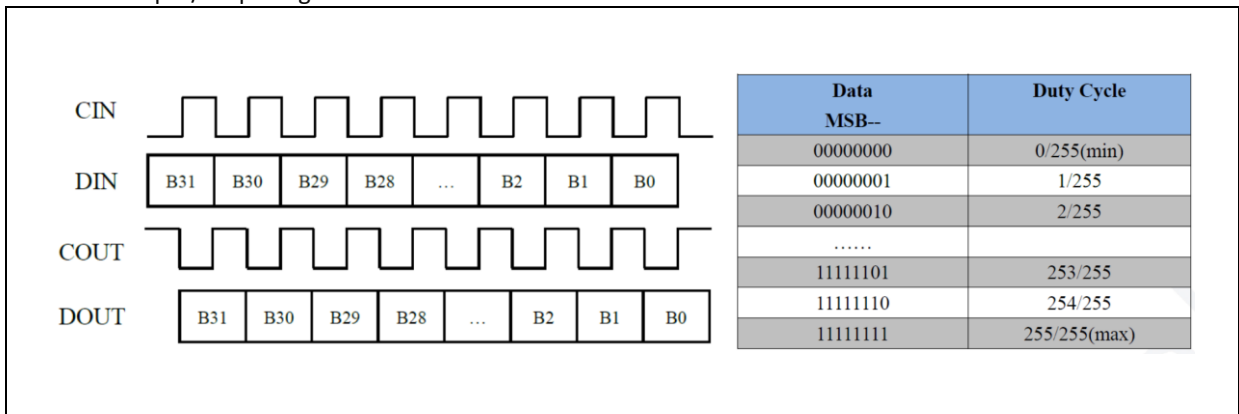| Relative Spectral Power v.s. Wavelength	Directive Radiation
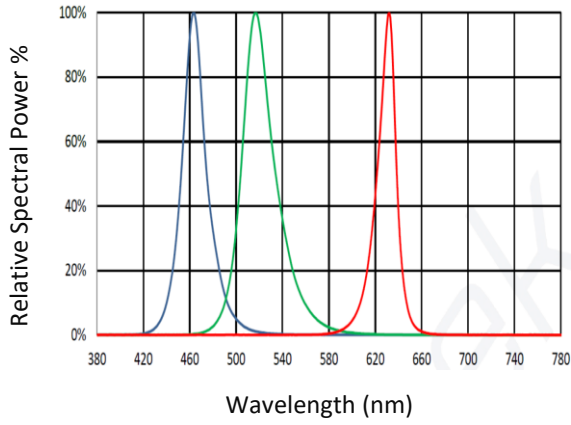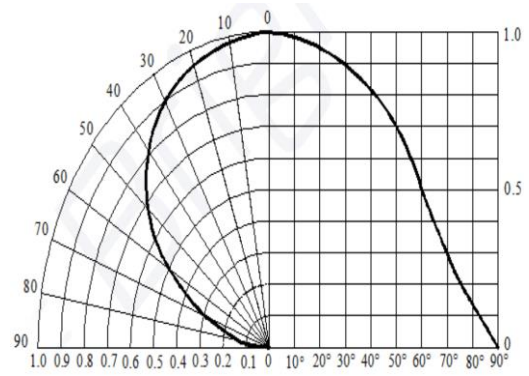
Function Description:

1. Series data structure:

2. Dim 5-Bit (level 32) brightness adjustment (simultaneous control of OUTR/OUTG/OUTB three port current):

Data MSB←→LSB	Driving Current
00000	0/31
00001	1/31
00010	2/31
……	
11110	30/31
11111	31/31(max)

3. PWM input/output signal relations:

Data MSB--	Duty Cycle
00000000	0/255(min)
00000001	1/255
00000010	2/255
……	
11111101	253/255
11111110	254/255
11111111	255/255(max)

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4. Sleep and power saving mode:

    LED supports the sleep/wake-up modes for power saving purpose. After the IC receives 24-bits 0's BGR data (that is B[7:0]=8h00, G[7:0]=8h00, R[7:0]=8h00), in the meantime, both of the data in 3-bits FLAG and 5-bits DIMMING is 8h'A0' (that is FLAG[2:0]=3b101 and DIMMING[4:0]=5b00000), the IC will entre sleep mode, its current is about 1μA.

    The IC will wake-up from sleep mode once receiving the new data with the data of FLAG[2:0], DIMMING[4:0] is not 8h'A0'; after wake-up, all sleeping circuits in IC return to normal working mode within 1ms. Since it takes 1ms for a sleeping IC returning to normal function mode, it is recommended for a host to wait for 1ms to send display data and command after issuing a wake-up command.

32 bits 0	Flag[2:0]= '101'	Dim[4:0]= '00000'	blue[7:0]= 0x00	green[7:0]= 0x00	red[7:0]= 0x00	Sleep mode

Sleep mode CODE

	LED1	LED2	LED3	LED4	LED5
Case1	Normal mode	Sleep mode	Normal mode	Normal mode	Sleep mode

	LED1	LED2	LED3	LED4	LED5
Case2	Sleep mode	Sleep mode	Sleep mode	Sleep mode	Sleep mode
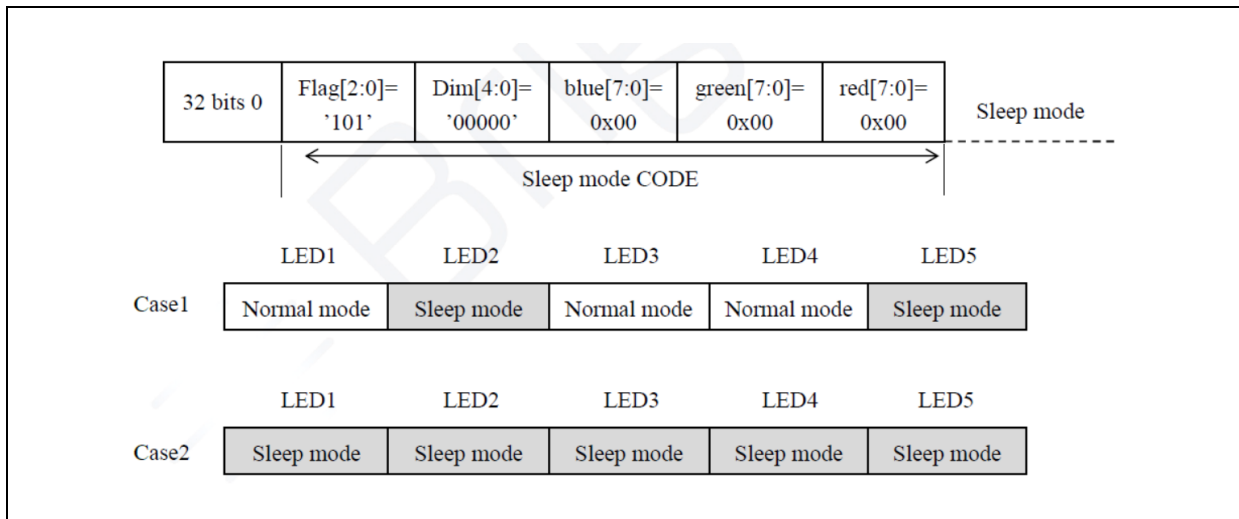
In case 1, while lamp 2 is under sleep mode, in the following data transfer process, the state of lamp 2 will be not changed as long as the 32-bits data for lamp 2 is received with data of FLAG[2:0] and DIMMING[4:0] being 8h"A0". It means lamp 2 will keep in sleep mode as well. In the situation, lamp 2 can pass through the remaining data to lamp 3 (32-bits) to change the display data of lamp 3. In other words, the sleeping chip is able to pass the data to the next chips.

RECOMMENDED SOLDERING PROFILE:
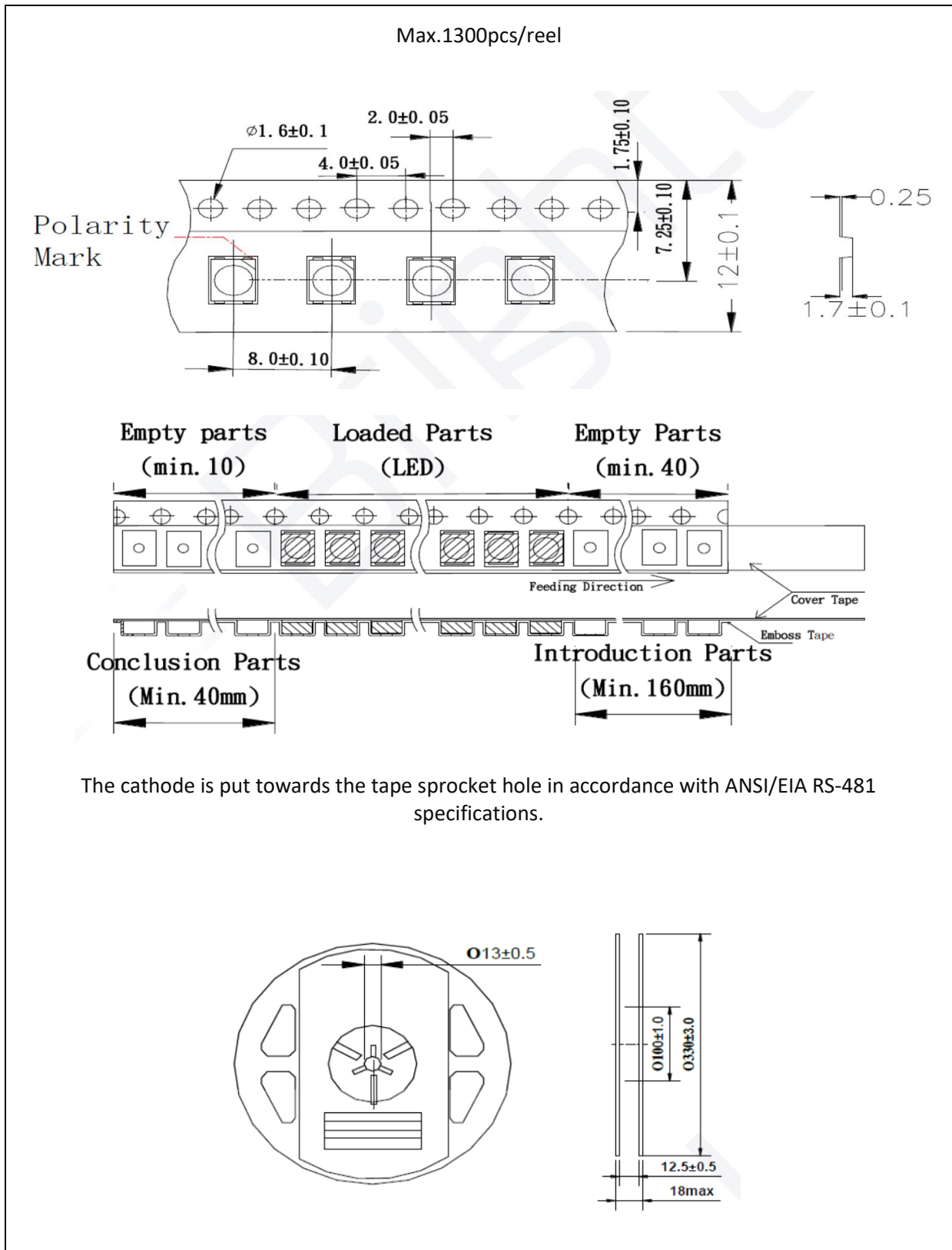
Lead-free Solder IR Reflow:
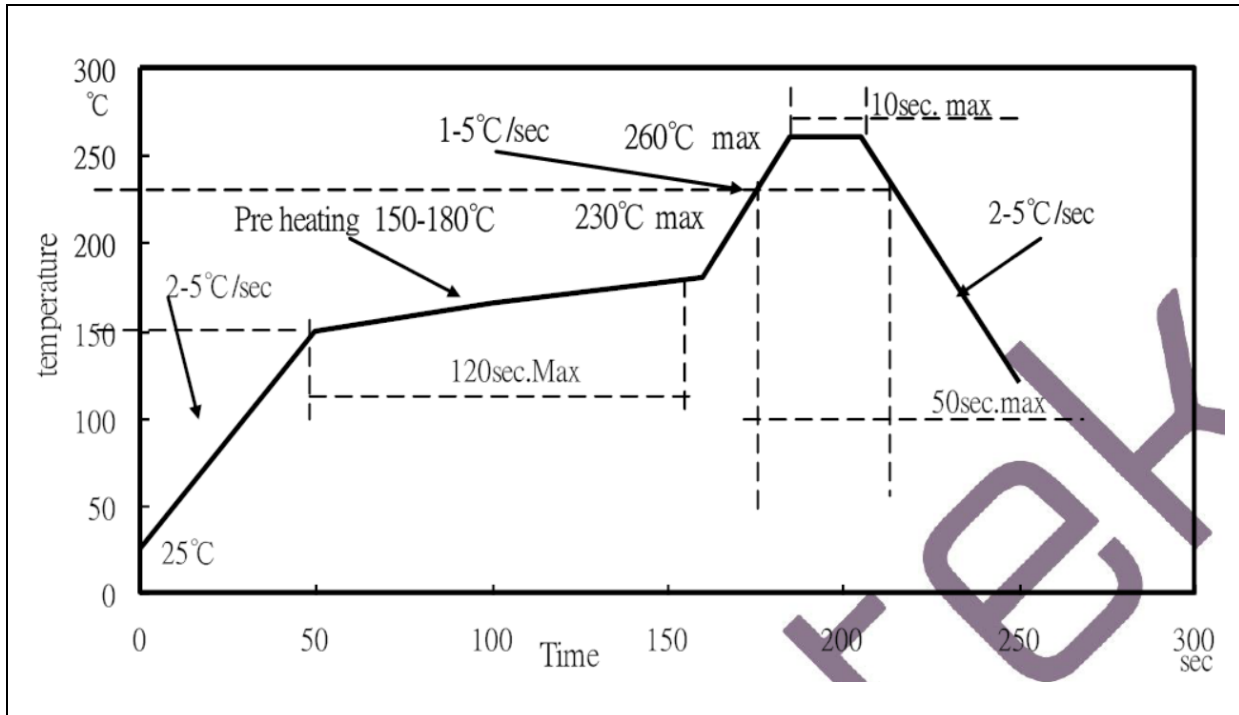
Note:

1. We recommend the reflow temperature 240°C (±5°C). The maximum soldering temperature should be limited to 260°C.
2. Maximum reflow soldering: 1 time.
3. Before, during, and after soldering, should not apply stress on the components and PCB board.

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PACKING SPECIFICATION:

Reel Dimension:

Max.1300pcs/reel

The cathode is put towards the tape sprocket hole in accordance with ANSI/EIA RS-481 specifications.

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PRECAUTIONS OF USE:

Storage:

It is recommended to store the products in the following conditions:
- Humidity: 60% R.H. Max.
- Temperature: 5°C~30°C (41°F ~86°F).

Shelf life in sealed bag: 12 months at 5°C~30°C and <60% R.H.

Once the package is opened, the products should be used within 24 hours. Otherwise, they should be kept in a damp-proof box with descanting agent stored at R.H.<10% and apply baking before use.

Over-Current Proof:

Must apply resistors for protection otherwise slight voltage shift will cause big current change and burn-out will happen.
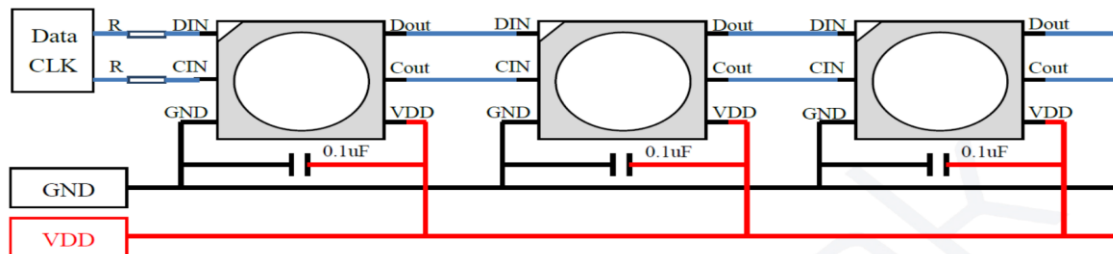
Baking:

It is recommended to bake the LED before soldering if the pack has been unsealed for longer than 24hrs. The suggested baking conditions are as followings:
- 60±3°C x 6hrs and <5%RH, taped / reel package.

It's normal to see slight color fading of carrier (light yellow) after baking in process.

Testing Circuit:

When the first LED is connected to the MCU, a resistance R is needed in series between its signal input line and the MCU. The size of R depends on the number of cascade beads. The more cascade, the smaller resistance R is used. It is generally recommended that the value be between 100-1K. Usually the recommended value is around 300 R. In order to make the LEDs work more stably, a parallel capacitor is needed between VDD and GND of each.

Cleaning:

Use alcohol-based cleaning solvents such as isopropyl alcohol to clean the LED carrier / package. Avoid putting any stress force directly on to the LED lens.

ESD (Electrostatic Discharge):

Static Electricity or power surge will damage the LED. Use of a conductive wrist band or anti-electrosatic glove is recommended when handing the LED all time. All devices, equipment, machinery, work tables, and storage racks must be properly grounded.

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REVISION RECORD:

Version	Date	Summary of Revision
A1.0	06/11/2019	Datasheet set-up.
A1.1	14/10/2021	New datasheet format.